edition, is incomprehensible, saving the assumption that both with respect to his father's annual reports and other sources, the son was wholly incapable of doing his father justice. It is a pity that the task of preparing a second German edition was not entrusted to a competent botanist, because the original work, apart from the uncompromising antagonism to Evolution that pervades it, still occupies an undisputed position in modern botanical literature. As it is, the French edition is not merely an advance on the original German—it is incomparably better than the second German edition. It is only, however, fair that some justification of such assertions should be given. Taking the chapter on Oceanic Islands as an example, it may be confidently stated that no additional information is given; yet there is no branch of geographical botany that has advanced more during the last decade than insular. On the other hand Tchihatcheff embodies nearly all that was known up to date. One slight alteration observed in this chapter is—Madeira is stated to be 50 German geographical miles nearer Europe than the Azores, instead of 150, as in the original. Then certain unfounded statements in refutation of the arguments of other botanists concerning the relationships of insular floras remain uncorrected. Thus, in allusion to Sir Joseph Hooker's demonstration ("Insular Floras," p. 7) that the vegetation of St. Helena has, on the whole, its nearest affinities in South Africa, it is objected, on the authority of Roxburgh, that three out of the five genera named by Hooker were originally introduced into the island from the Cape of Good Hope, whereas an examination of Roxburgh's enumeration of the plants of St. Helena reveals the fact that the indigenous, and endemic, St. Helena species of the genera in question were unknown to him, and his remarks apply only to actually introduced species. Again, to repeat in 1884 such statements as that the vegetation of Juan Fernandez has little systematic relationship with that of the Chilian or Antarctic floras and that *Pringlea antiscorbutica* is restricted to Kerguelen Island is unpardonable, because the contrary is now historical. Defects such as those pointed out are numerous, but as they are mostly due to the state of knowledge fifteen years ago, the author of the work of that date is not to be blamed for them; rather the present editor and publisher for offering the public an old book as new.

W. BOTTING HEMSLEY

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

Nomenclature in Elasticity

THE word *stress* is used, sometimes in the sense of *load*, sometimes in that of *load per unit area*. Clearness, however, requires these two ideas to be kept perfectly distinct, and therefore to be denoted by separate terms. *Load* is surely expressive enough, or, if not, there is the more comprehensive word *force*: why then use *stress* synonymously? It would be far better to reserve *stress* to signify *load per unit area*. This Prof. Kennedy (p. 269) calls *intensty of stress*; but why not *stress* simply? The word *intensity* is not in itself suggestive of anything distinctive, and is therefore useless.

Pressure and *tension* are terms used in the same loose manner, though, when intended to represent *force*, they sometimes have the word *whole* prefixed. Is it not better to say *force* when we mean *force*? We can then reserve *pressure* and *tension* as vector-synonyms of *stress* in the sense of *force per unit area*, which is indeed their usual *rôle*.

Another misused term is *resilience*, which sometimes denotes the *work* done in producing *proof* strain in a body (Rankine's definition), sometimes the *work* done *per unit volume* in producing *proof* strain, sometimes the *work* done *per unit volume* in producing *any* strain. I prefer, myself, the third definition: the second would then be the *proof resilience*, and the first might be called the *strain-energy*.

However, whatever terminology is finally agreed upon, let it be perfectly definite and consistent.

In his Fig. 1 (p. 269) Prof. Kennedy writes: "Breaking load, 18·85 tons per square inch." According to his own nomenclature, he should surely say: "*intensity of* breaking *stress* 18·85 tons per square inch," and this I should prefer to call simply the breaking stress—premising that for *tons* I should write *tons' weight*. In this case, as the diameter is ¾ inch, and therefore the section ·442 square inch, the breaking *load* is 8·33 tons' weight. Similarly in the other figures.

Christ Church, Oxford ROBERT E. BAYNES

Earthquake-Proof Buildings

MR. MUIR is quite correct as to the facts and date of the introduction of the aseismatic tables into Japan. In 1869–70 seven aseismatic tables for carrying the lighting apparatus were sent from here and erected in Japan, and Mr. Simpkins, who has recently returned from Japan, informs me that there are three in action at present. Two iron towers, 46 feet high, with this arrangement at their base, were also constructed and shipped for Japan, but the vessel was lost and no more were sent out, as the engineer in charge—Mr. Brunton—took an unfavourable view of their efficiency—his idea being that they would not work, as he considered that buildings of "great weight and solidity, thereby adding to their inertia and checking their oscillation, were best suited to meet the difficulty in Japan." Mr. Milne's experiments with aseismatic tables have borne out Mr. David Stevenson's original view as to their power of mitigating an earthquake shock. For fuller information see NATURE, vol. xxx. p. 193. D. A. STEVENSON

Edinburgh, August 3

A Mechanical Telephone

HAVING observed in this week's NATURE a notice of a "mechanical telephone" said to be brought from America, I may state that so far back as 1878 I experimented on the transmission of sounds by wires, and communicated the results obtained, from a large number of experiments, to the Physical Society of London in March, 1878; the paper being afterwards published in the *Philosophical Magazine* for August, 1878. These experiments are referred to by the Count du Moncel in his book on "The Telephone," published in 1879. I found no difficulty in carrying on a conversation through wires laid in various ways from room to room of a house; and musical sounds, breathing, and whistling were also readily transmitted, and through most unlikely arrangements, such as a common wire fence. Various materials were tried for the transmitting and receiving ends—disks of cardboard set in deepish rims being found to give excellent results with a No. 16 copper wire. In one of my experiments I found that the disks were not required, the wire itself picking up and transmitting the sounds. The results obtained were most interesting; but as the range was necessarily limited, it did not seem to me that there was much scope for practical application. W. J. MILLAR

100, Wellington Street, Glasgow, July 31

Electrical Phenomenon

ABOUT ten o'clock in the evening of July 23 a party of four of us were standing at the head of the avenue leading to this house, when we saw a feebly-luminous flash appear on the ground at a distance of some thirty yards down the avenue. It rushed towards us with a wave-like motion, at a rate which I estimate at thirty miles an hour, and seemed to envelop us for an instant.

My left hand, which was hanging by my side, experienced precisely the same sensation as I have felt in receiving a shock from a weak galvanic battery. About three minutes afterwards we heard a peal of thunder, but, though we waited for some time, we neither saw nor heard anything further.

The gardener, who was one of the four, thus describes what he saw:—I thought it was a cloud of dust blowing up the avenue, and before I could think how that could be when there was not a breath of wind, I saw you three gentlemen covered for a second in a bright light, and that was all. Another of the party says that he observed what seemed to be a luminous cloud running up the avenue with a wavy motion. When it reached the party it rose off the ground and passed over the bodies of two of them, casting a sort of flash on their shoulders. The distance traversed was about twenty yards, and the time occupied between two and three seconds. (My own estimate of distance and velocity makes the time occupied almost exactly two seconds.) The day had been extremely hot and sultry, as also had the preceding day been, the thermometer readings being sometimes 80° F. in the shade.

On asking the gardener for further particulars, he tells me that the distance traversed by the luminous cloud was about forty yards, and that, when it had gone about half the distance, he saw a flash of lightning in the direction of it, but sideways; also that the top of the cloud seemed to be three or four feet from the ground, and it gradually rose higher as it came along. When the cloud reached the party he saw one of them distinctly by its light, the night being otherwise quite dark at the time; and, lastly, that the cloud went a few yards beyond the party into the open space in front of the house, and then disappeared.

J. B. A. WATT

Marchfield, Davidson's Mains, Midlothian

Our Ancestors

DURING eight centuries—say to the time of the Norman conquest—one's direct ancestors amount to a far greater number than would at first be contemplated. Taking three generations to a century, one has father and mother (2), grandparents (4), great-grandparents (8). At the end of the second century the number of ancestors springs to 64. Following the calculation you will find that at the end of eight centuries one is descended from no less than 16,000,000 ancestors. Intermarriage of course would reduce this estimate, and there is no doubt it must have largely prevailed. But the figures are so enormous that, in spite of all, I venture to suggest that the words "All ye are brethren" are literally true.

$\left(\frac{1}{2}\right)^n$

CO-ORDINATION OF THE SCIENTIFIC BUREAUS OF THE U.S. GOVERNMENT

A MOVEMENT is on foot in the United States for rearranging the various scientific departments of the Government under one central authority, and a report on the subject has been made by a committee of the National Academy of Sciences, consisting of Gen. Meigs, and Professors Trowbridge, Pickering, Young, Walker, and Langley, appointed for the purpose. The Report is published at length in *Science*. After referring to the state of things in Europe in this respect, it gives a brief account of the method in which such bureaus are organised in other countries; discusses at some length the character of the work done by the coast and geodetic and the geological surveys, especially in those points where their provinces are similar, pointing out that two distinct and independent trigonometric surveys of the United States are now in process of execution; distinguishes between the military and meteorological work of the Signal Service, and recommends their complete separation; indicates the danger of duplication of work by the Coast Survey and Hydrographic Office, but is not prepared to recommend that the latter be detached in any way from the control of the Navy Department, nor that the hydrographic work of the Coast Survey, for over forty years conducted so satisfactorily, be separated from that organisation, but suggests the lines on which it thinks the Coast Survey should work; lays down the principle that the Government should not undertake any work which can be equally well done by the enterprise of individual investigators, and that such work should be confined to what will "promote the general welfare of the country;" urges the importance of a proper extension of the trigonometrical survey of the United States; and, finally, recommends either the establishment of a department of science, or of a mixed commission of nine members—two of them scientific civilians to be appointed by the president for six years, two scientific men from the army and navy, three heads of the principal scientific bureaus, together with the president of the National Academy, and the secretary of the Smithsonian Institution.

To the Department of Science, or to the supervision of this Commission, it would transfer the Coast Survey, the Geological Survey, and the Meteorological Bureau, and establishing a physical laboratory, add to it a Bureau of Weights and Measures, the functions of which are now performed by the Coast Survey. The province of the proposed Commission is amply defined.

In the course of the Report the Committee give an interesting sketch of the work accomplished by the Coast Survey.

The Coast Survey was originally organised for the purpose of constructing maps and charts of the coast and harbours for the benefit of commerce and navigation. Conflicting opinions respecting the proper management of the Survey led to the formation, in 1843, of a board of officers with the duty of reorganising the Survey. This board submitted a plan which was enacted by Congress into law, upon and under which law the Survey has hitherto been executed. This plan provided for the cooperation of military officers, naval officers, and civilians in the various parts of the work. Under it the work of the Coast Survey has been continued to the present time.

In recent times a great extension of the field of operations of the Survey has been made, apparently looking to a triangulation covering the entire territory of the United States. The maps published annually with the report of the Survey enable us to know the geodetic work it has executed. It appears, from the maps accompanying the report of 1882, that on June 30 of that year a chain of triangles had been extended throughout the entire length of the Atlantic and Gulf coasts, and throughout about half the Pacific coast. Besides these coast-lines, extensive regions in the interior are seen to be triangulated. In the north-east, the triangulation covers the greater part of the States of New Hampshire, Vermont, and Massachusetts, about half of Connecticut, and it also includes a considerable part of the State of New York.

The reconnaissance has extended westward from the New Jersey coast, so as to include the greater part of the State of New Jersey, and a long strip in Pennsylvania. From Pennsylvania, the extended line of primary triangulation follows the Alleghany Mountains into Northern Alabama, and is now being continued across the country to Memphis.

A triangulation of the Mississippi River was extended from its mouth nearly to Memphis, where it would meet the last-described chain of triangles. The chain connecting the Atlantic and Pacific coasts has been completed nearly across the State of Nevada, and the reconnaissance includes nearly half of Utah Territory. The line is also surveyed at various points in Colorado, Kansas, Missouri, and Illinois. Besides all this, isolated regions in Wisconsin, Indiana, Illinois, Ohio, Kentucky, and Tennessee have been reconnoitred by the Coast and Geodetic Survey, in a way indicative of a plan designed ultimately to cover the entire territory. As its appropriations for some years past have made provision for the collection of data for a general map of the United States, we may fairly regard